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(54) **SYSTEM AND METHOD FOR VOICE BASED NETWORK MANAGEMENT**

(75) Inventor: **Darryl Sladden**, Sunnyvale, CA (US)

(73) Assignee: **Cisco Technology Inc.**, San Jose, CA (US)

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(52) **U.S. Cl.** **704/270.1**; 704/275; 709/223; 709/224

(58) **Field of Classification Search** 704/275, 704/270.1; 709/224

See application file for complete search history.

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Primary Examiner—David Hudspeth

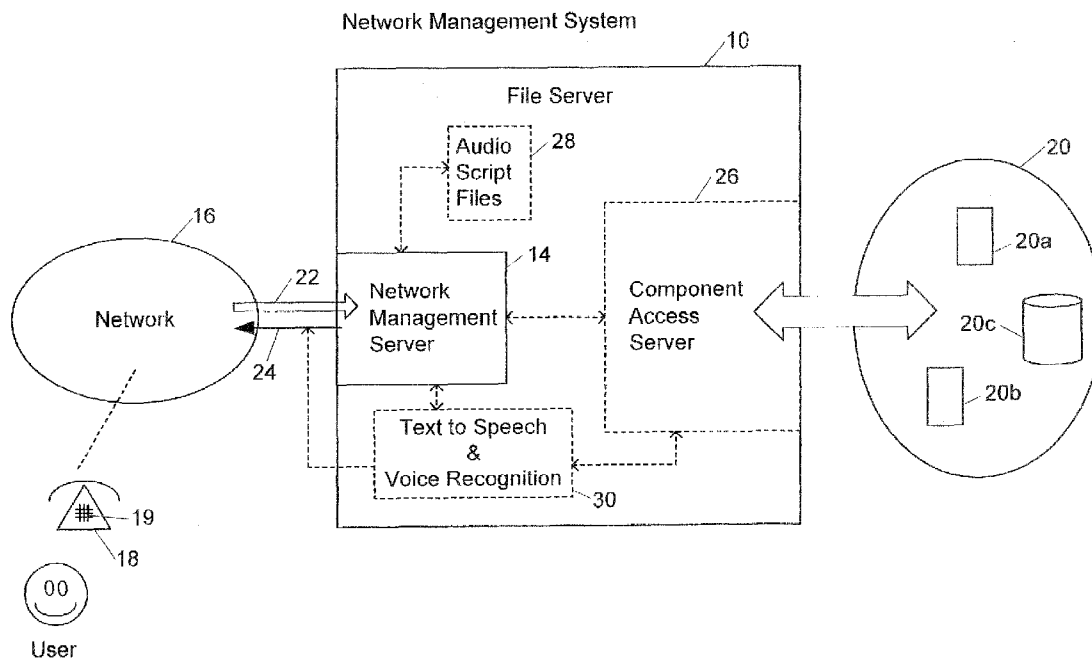
Assistant Examiner—Justin W. Rider

(74) *Attorney, Agent, or Firm*—Stolowitz Ford Cowger LLP

(57) **ABSTRACT**

The present invention provides a system and method for voice based network management. A network management system uses voice based scripts that allow network management operations to be performed over a phone. In one embodiment, the voice based scripts use a Voice Extensible Markup Language (VXML). However, the voice based script can be any form of communication that allows a user to conduct network management operations using Dual Tone Multi-Frequency (DTMF) signaling or speech commands.

43 Claims, 6 Drawing Sheets



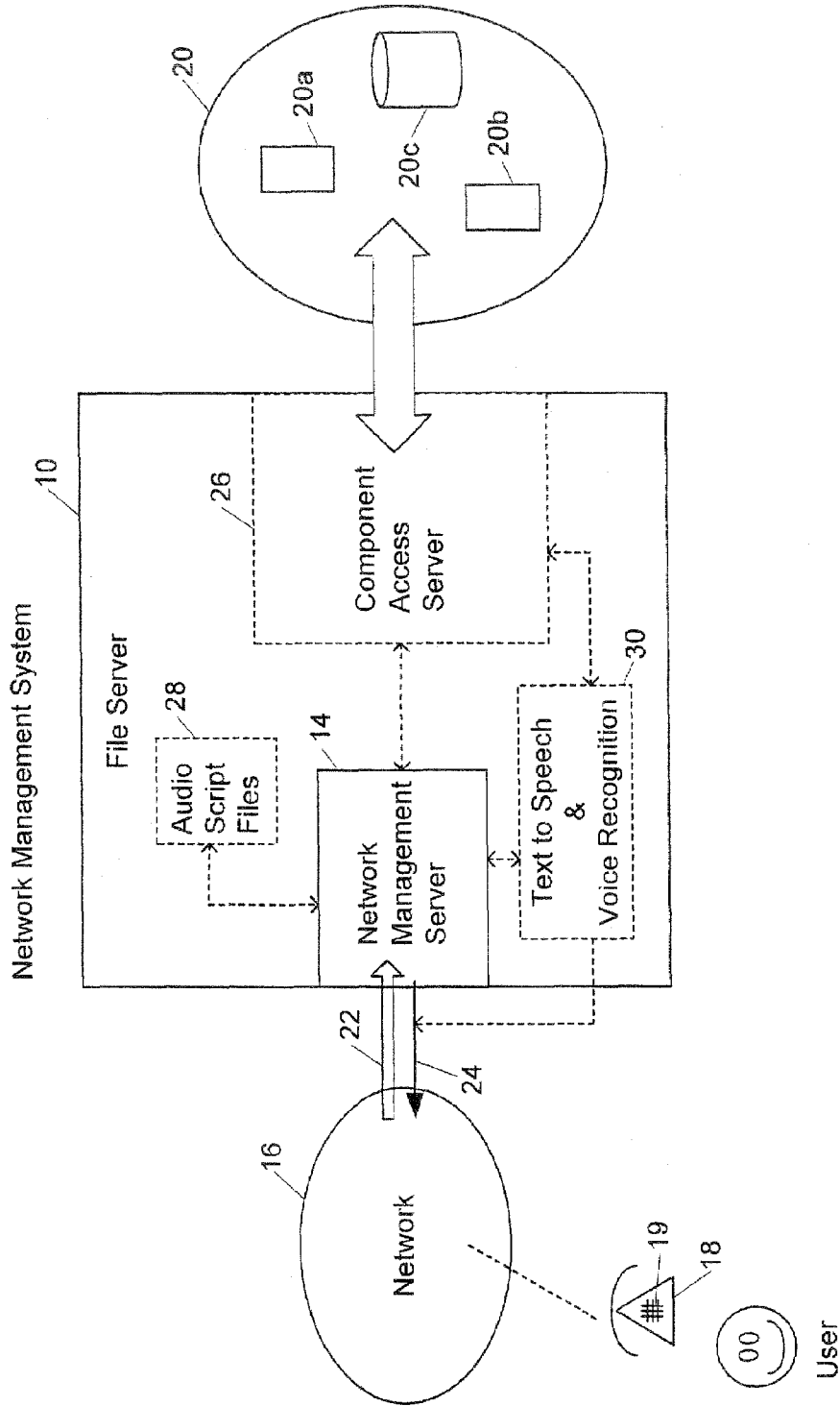


FIG. 1

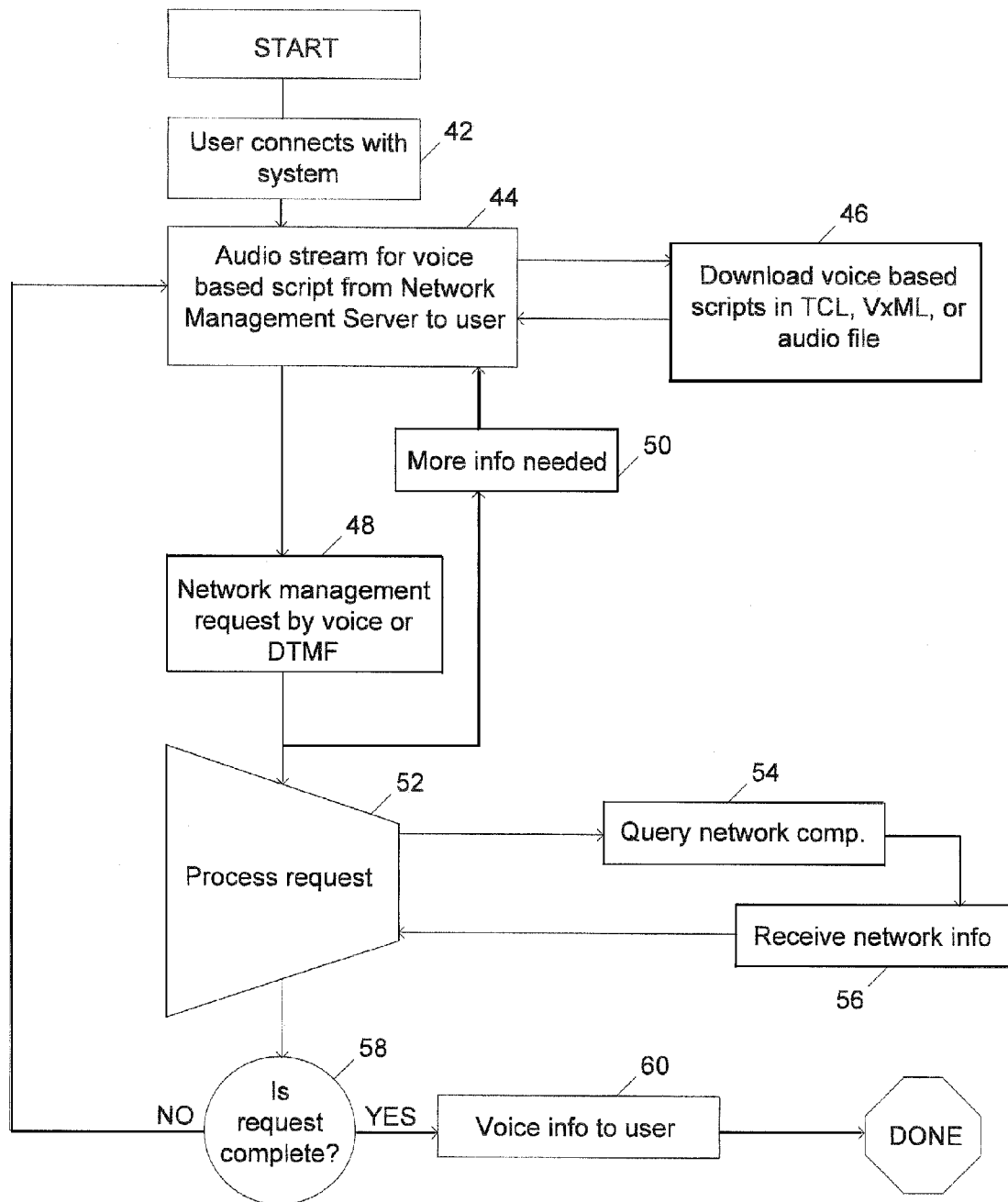


FIG. 2

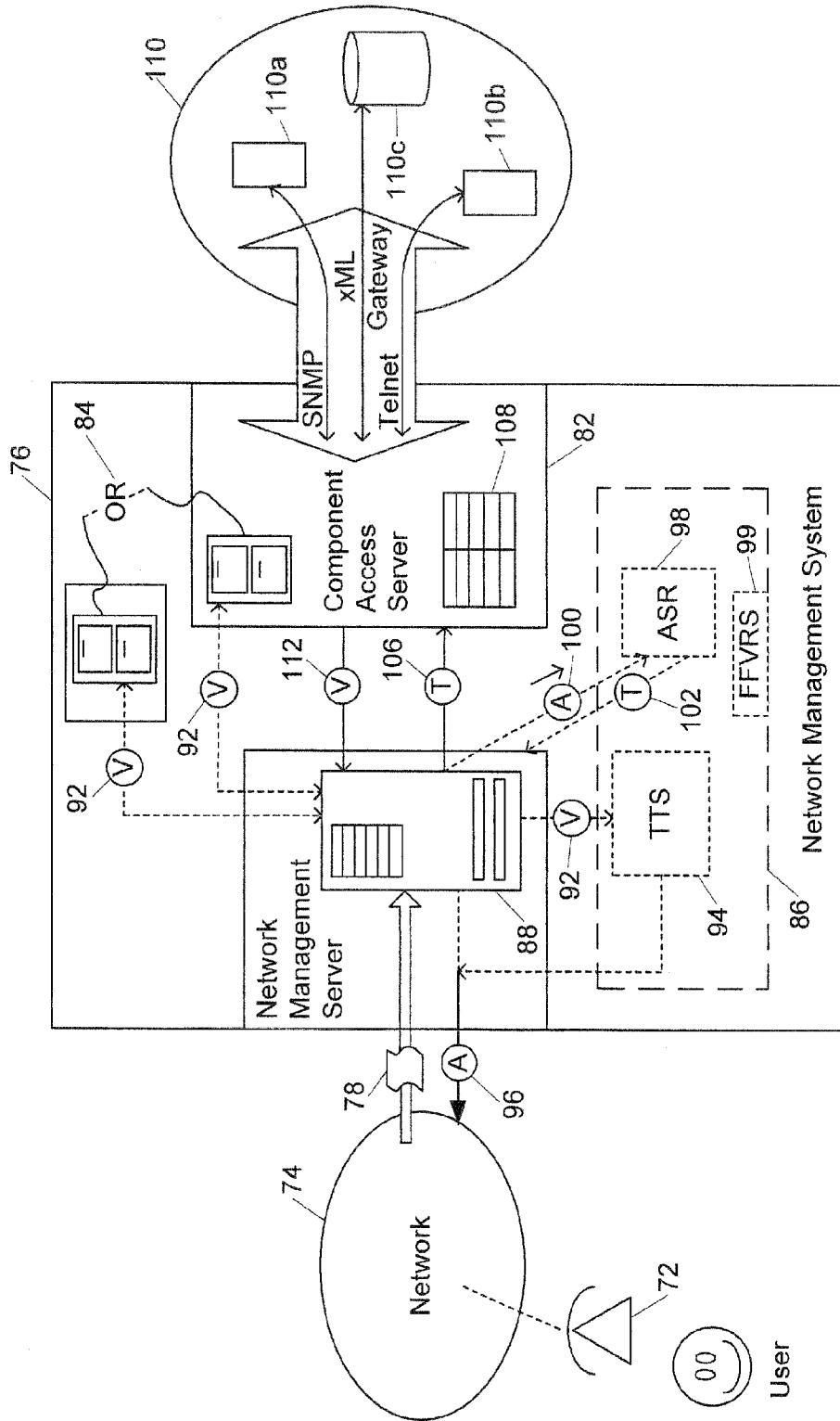


FIG. 3

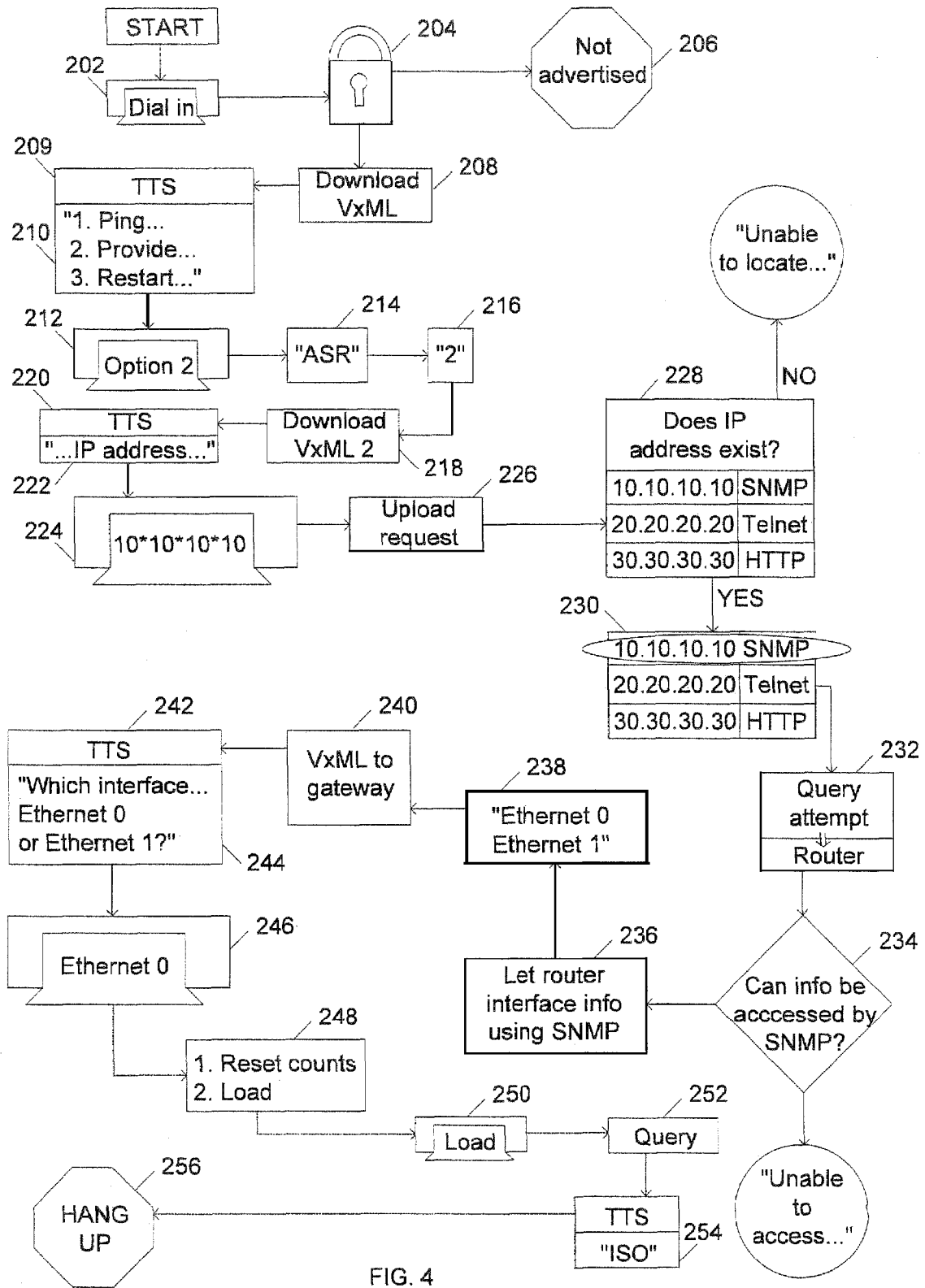


FIG. 4

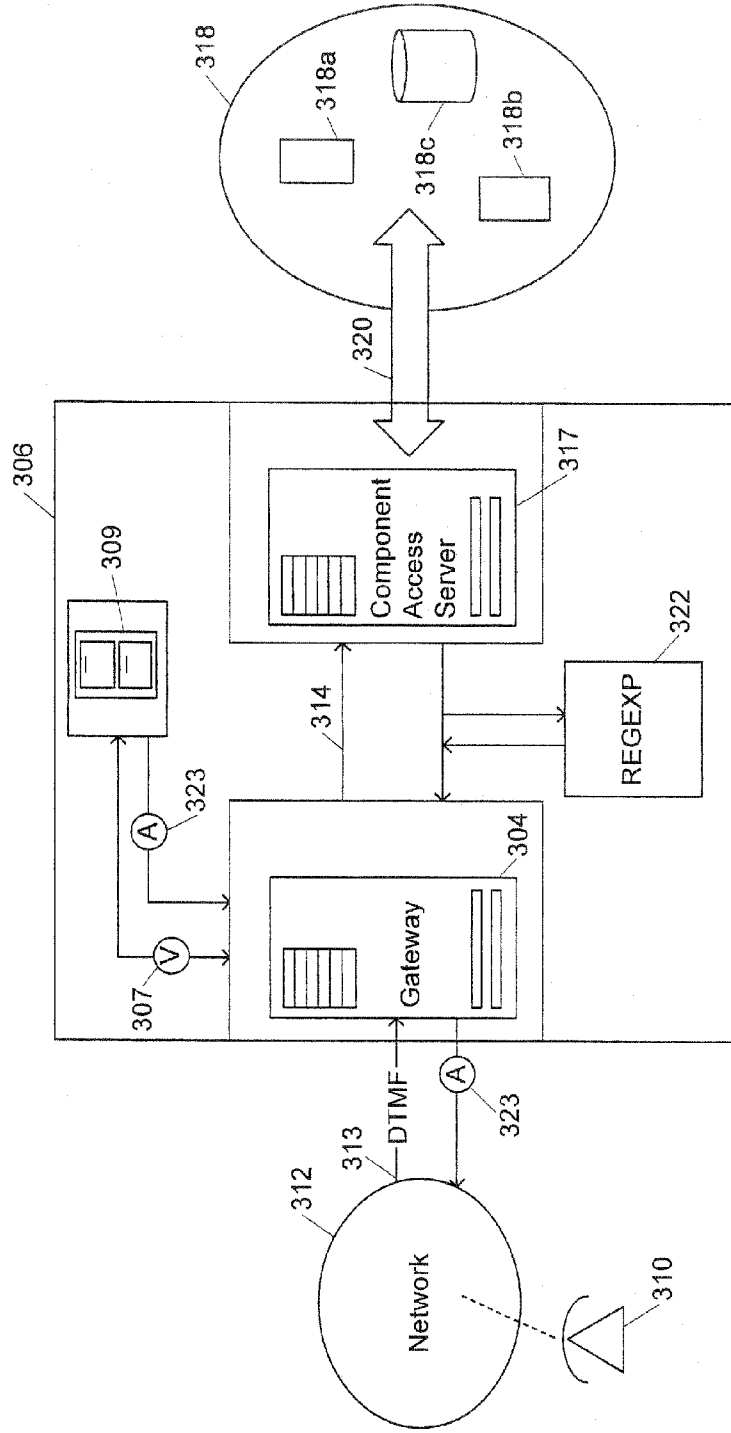


FIG. 5

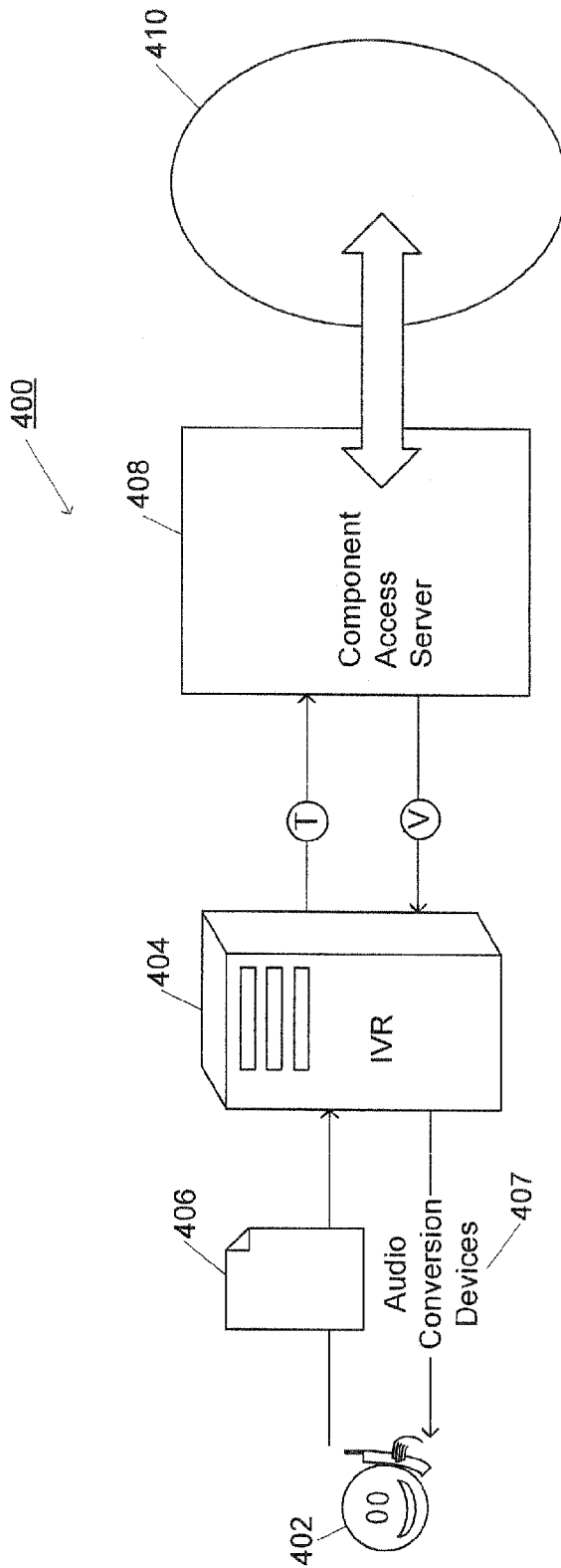


FIG. 6

SYSTEM AND METHOD FOR VOICE BASED NETWORK MANAGEMENT

BACKGROUND

1. Field of the Invention

The present invention pertains to the field of network management.

2. Background of the Invention

A computer network generally includes a number of network devices or components, such as routers, switches, gateways, etc. Generally, each network device has status conditions that may continuously change during operation. For example, a network router may have a variable number of network connections open at any one time.

Network management pertains to issuing commands and gathering information from these network devices. For example, a network administrator may want to monitor or manage the number or type of network connections for the router or simply verify the router is up and running. Different network protocols such as SNMP (Simple Network Management Protocol), Telnet, or HTTP (Hypertext Transfer Protocol) are used for conducting these network management operations.

The problem with current network management systems is that they require a computer terminal for accessing the network device and retrieving the network management data.

SUMMARY OF THE INVENTION

The present invention provides a system and method for voice based network management. A network management system uses voice enabled scripts that allow network management operations to be performed over any generic POTS phone. In one embodiment, the voice based scripts use a Voice Extensible Markup Language (VXML). However, the voice enabled script can be any form of communication that allows a user to conduct network management operations using Dual Tone Multi-Frequency (DTMF) signaling or speech commands.

Other features and embodiments of the present invention will be apparent from the accompanying figures and from the detailed description, which follows.

BRIEF DESCRIPTIONS OF THE DRAWINGS

The invention may best be understood by reading the disclosure with reference to the drawings, wherein:

FIG. 1 is a general schematic representation of a network management system according to the present invention;

FIG. 2 is a flow chart showing how a network management operation is performed using the network management system;

FIG. 3 is a more detailed schematic representation of one embodiment of a network management system;

FIG. 4 is a flow chart showing how a network management operation is performed using a phone;

FIG. 5 is a schematic showing an alternative embodiment of the network management system; and

FIG. 6 is a schematic showing another alternative embodiment of the network management system where audio processing is outsourced.

DETAILED DESCRIPTION OF EMBODIMENTS

Several embodiments of the present invention are described below. Although the specification may refer to “an”, “one”, “the”, “some,” “alternative,” or “exemplary” embodiment(s) in several locations, this does not necessarily mean that each such reference is to the same embodiment(s), or that the feature only applies to a single embodiment. Additionally, it will be evident to one skilled in the art that the present invention is not limited by the described embodiments.

FIG. 1 shows a network management system 10 according to the present invention. System 10 includes a network management server 14 that can be any type of network processing device such as a server, gateway, router, switch, etc. A network 16 communicatively couples server 14 to a phone 18. In one example, network 16 is a PSTN (Public Switched Telephone Network). However, network 16 can be any network that connects phone 18 to server 14. Phone 18 may be a conventional wired telephone; a wireless telephone, such as a cellular telephone; a VoIP (Voice Over Internet Protocol) phone; or any other type of device used for sending and receiving audio and DTMF signals. In the case of the VoIP phone, part of network 16 may be an IP (Internet Protocol) network.

In some embodiments, the network management server 14 may implement security measures to ensure that a user is authorized to perform network management operations. For example, server 14 may use ANI (Automatic Number Identification) to identify the number of the caller and use DNIS (Dialed Number Identification Service) to identify the number dialed by the user. Server 14 then matches the ANI and DNIS numbers with stored authorized phone numbers. In other embodiments, server 14 may use a PIN (Personal Identification Number) and/or other security measure(s) to authenticate the user.

The network management server 14 generates one or more voice enabled scripts after the user is authenticated. The voice enabled scripts are alternatively referred to as voice based scripts or voice scripts. In one example, the server 14 supports voice based scripts generated using VxML (Voice Extensible Markup Language). VxML is known in the art and therefore is not described in further detail. Alternatively, server 14 may generate voice enabled scripts using a TCL (Tool Command Language) and will also use audio files for user interaction. The user on phone 18 responds to the voice script with a network management request 22. The request 22 is either a verbal request spoken by the user or DTMF (Dual-Tone Multi-Frequency) signals generated when the user presses keys 19 on a keypad on phone 18.

Network management server 14 communicates the request 22 to the network management system 10. The network management system 10 processes the request 22 by accessing and querying network components 20. The particular network component 20 accessed may be identified in the request 22. For example, the user may identify a router IP address by generating DTMF signals or by speaking the router address into phone 18.

Network components 20 may include, for example, a router 20a, IP phone manager 20b, and customer data sources 20c. Customer data sources 20c may include traditional network management data, located, for example, at a certain URL (Uniform Resource Locator). Network components 20 are not limited by the above examples, and may include any type of network device that needs to be queried for network management data. Methods of accessing and

obtaining management information from network components **20** are known in the art and include SNMP (Simple Network Management Protocol), Telnet, and HTTP (Hypertext Transport Protocol).

Network management system **10** retrieves network device information from one or more of the components **20** and returns it to the user via the network management server **14**. The management information retrieved from components **20** is converted into voice based scripts, for example, using a VxML page. The VxML page is then audibly rendered by server **14** to the phone **18** as an audio stream **24**. If applicable, the user at phone **18** may then make further network management requests, or simply hang up. For example, the voice script may list multiple interfaces on one of the network components **20** and query the user to select one of the verbally identified interfaces. The user would then select one of the verbally identified interfaces either by verbally speaking the interface name or pressing keys on phone **18**.

Some embodiments of network management system **10** include a component access server **26**. In one embodiment, the component access server **26** receives a request from the network management server **14** for management information. Server **26** determines how to access a particular network component **20**, and then queries the network component **20** and retrieves the management information requested by server **14**. In other embodiments, the functions performed by component access server **26** are performed by server **14**.

Other embodiments of network management system **10** include a file server **28** that may be a separate device or part of network management server **14**. File server **28** stores and provides voice based scripts to server **14**. In another embodiment, the file server **28** stores and provides pre-recorded audio files that are played out by network management server **14**.

Other embodiments of network management system **10** include an audio conversion component **30**. The audio conversion component **30** may be a separate device or program that translates between an audio stream and computer readable text. For example, the audio conversion component **30** may include a TTS (Text-To-Speech) system that converts the voice based scripts from server **28** to audio streams for outputting to phone **18**. The audio conversion component **30** may also include an ASR (Automatic Speech Recognition) system for converting audio streams from phone **18** into computer readable text.

FIG. **2** is a flow chart showing how a network management operation is performed by the network management system **10** shown in FIG. **1**. In box **42**, a caller connects with the network management system by calling into the network management server **14** via phone **18**. As described above, security measures may be implemented to ensure that the caller is authorized. In box **44**, the network management server **14** reads out a voice based script to the user, for example, as an audio stream. In one embodiment, as shown by box **46**, the script may be downloaded as a VxML page from the file server **28**. In other embodiments, the script may be a TCL (Tool Command Language).

In box **48**, the user responds to the script either by speaking a network management request or by generating DTMF signals via keys on the phone keypad. If more information is needed from the user prior to processing the request, additional audio scripts are provided to the user in box **50**. In this case, additional audio scripts may be downloaded from the file server **28**. Once enough information has been received from the user, the network management server **14** processes the request in box **52**. Box **54** illustrates one

embodiment where the request is processed by querying a network component using a standard access method, such as SNMP, Telnet, or HTTP. The management information from the network component is retrieved in box **56**.

In box **58**, the network management server **14** determines if the request has been completely processed or if more information is needed. If the request is not complete, another voice based script is spoken to the user in box **44**. The next voice script may also contain some or all of the information obtained from the network component. For example, the voice script may identify each interface for a particular network component. The voice script would then ask the user to select one of the identified interfaces and identify what information should be queried for the selected interface.

If the request is complete, then the information in the voice script is output to the user in audio form in box **60**. For example, a VxML page is translated to audio and sent to the user phone. If the user is satisfied, the process is complete and the user may hang up. Alternatively, the network management server **14** may provide the user with the option to make another request or to modify or correct the previous request, in which case, the process will loop back to box **44**.

FIG. **3** is a more detailed schematic representation of a network management system **76** comprising a network management server **88**, component access server **82**, file server **84** and audio conversion component **86**. Network management server **88** may be any router or routing software known in the art that supports a voice based language, such as VxML. For example, network management server **88** may be a VxML enabled IOS (Inter-network Operating System) based gateway. In one embodiment, network management system **76** is a single device that performs all the operations of servers **88**, **82**, and **84**. In another embodiment, file server **84** is implemented in server **88** or server **82**. Alternatively, file servers **88**, **82**, and **84** are separate stand alone devices connected together through an IP and/or circuit switched network.

A user at telephone **72** dials into the network management server **88** via network **74**. Server **88** reads out a voice enabled script **92** from server **84**, or a manipulation thereof, as an audio stream **96**. In one embodiment, server **88** passes the voice based script **92** to a TTS (Text-To-Speech) device **94** that reads out the audio stream **96** to the phone **72**. One type of TTS device **94** converts a text string to an audio media stream encoded in G711. Alternatively, the server **88** may have an internal speech generation system.

In response to the audio stream **96**, the user at phone **72** makes a network management request **78** either by voice or by DTMF signaling. In one embodiment, network management server **88** uses an ASR (Automatic Speech Recognition) device **98** to translate a spoken response from an audio stream **100** extracted from request **78** into computer readable text **102**.

In one embodiment of the present invention, audio conversion component **86** also includes a FFVRS (Free-Form Voice Response System) **99** that translates a free-form voice response received from the phone **72**. A free-form voice response may comprise a voice response by the user in descriptive language not recognizable by, for example, a VxML script. Free-form voice response system **99** may comprise a storage device with a stored vocabulary and thesaurus of lexical structure and terms. System **99** may, for example, parse individual words from the voice response into recognizable tokens by interpreting the free-form voice response against the vocabulary in system **99**.

In one embodiment, TTS **94**, ASR **98**, FFVRS **99**, and any other audio conversion devices are implemented in software in server **88** or **82**. Alternatively, one or more of TTS **94**, ASR **98**, and FFVRS **99** are stand alone devices or implemented as part of another server, or other network component.

Considering that the user may be using a cellular phone while driving, or be in other noisy or distracting conditions, the audio conversion component **86** may comprise additional technologies to increase audio clarity or reduce noise.

As described above, if the user response to the first voice based script **92** is insufficient to completely process the request **78**, additional voice based scripts **92** are downloaded from server **84** to server **88**. The interaction with the user of phone **72** continues until the network management server **88** has sufficient information to process the request from the user.

Server **88** routes computer readable text **106** containing the network management request **78** to component access server **82**. In one example, the computer readable text **106** contains an IP address provided by the user to identify a network component **110**. In this example, server **82** uses the IP address to access a lookup table **108** to determine how to access the identified network component **110**. For example, a router **10a** may be accessed using SNMP, an IP manager **110b** may be reached using a Telnet connection, and a customer database **110c** may be reached via an XML gateway.

Network information from the network component **110** is processed by component access server **82** and returned to management server **88** using voice based script **112**. Voice based script **112** may provide the user with a complete answer to the request **78** or provide further network management options. Network management server **88**, using, for example, TTS **94**, generates speech that reads out the voice based script **112** to the phone **72**. As described above, this process can repeat until the user audibly hears all the necessary network management information.

FIG. 4 is a flow chart showing an example of how network management operations are performed using a phone. Referring to FIGS. 3 and 4, at box **202**, a user dials into the network management server that supports VxML. At box **204**, the server determines if the user is authorized to access network management tasks. As described above, ANI, DNIS, and/or PIN or other security measures may be used for authorization.

If the user is not authorized to access network management tasks, at box **206**, a message is voiced to the user that access the network is not authorized. If the user is authorized to access network management tasks at box **208**, a VxML script is downloaded to the network management server **88**. In the example of box **209**, the VxML script is sent to a TTS device. In box **210**, the TTS device voices the VxML script to the user phone **72**. In this example, the VxML script provides the following network management options to the user:

1. Ping a network component to determine if it is up and available
2. Provide information on the interfaces of a router
3. Restart router

The VxML script may be programmed to provide any variety of network management options.

At box **212**, using the phone, the user selects option **2**, requesting information on a router interface. In one example, the user states, "option **2**." Alternatively, as described above, a user may select option **2** by pressing the **2** key on the phone

keypad or describe option **2** in free-form language. In box **214**, the user's audio stream is routed to the ASR. In box **216**, the ASR returns a text value of "2" along with a confidence level. In box **218**, a second VxML script is downloaded to the network management server.

In box **220**, a second VxML script asks the user to enter an IP address for the desired router. In box **222**, the TTS plays the IP address query script as an audio stream to the phone. In box **224**, the user enters the IP address either by speaking it or using DTMF signaling. In the example, an IP address of 10.10.10.10 is entered on the phone keypad (DTMF signaling) as 10*10*10*10. In box **226**, the user response is uploaded to the component access server **82** (FIG. 3).

In box **228**, the component access server looks up the IP address in lookup table **108**. The lookup table may be internal to the component access server. Alternatively, the lookup table may be located on a remote server.

If the IP address does not exist in the lookup table, then the network management server **88** may upload a VxML page stating, for example, "unable to locate IP address." In box **230**, the IP address is found. The network component server **82** uses the lookup table to determine the access method for accessing the network component **110** associated with the selected IP address. As described above, some access methods may include XML, HTTP, SNMP, or Telnet.

In box **232**, the component access server **82** sends a query to the identified network component **110**. Here, the network component having IP address 10.10.10.10 is queried. An SNMP query is sent to the specified network component along with the appropriate OID (Object Identifier). Of course, the lookup table is only exemplary, and any access method and IP address combination contemplated by the art can be used. For example, a Telnet or XML query may be accompanied with a user id and password.

In box **234**, the network component server determines what needs to be accessed from the component **110** based on the user's request. If the information requested cannot be accessed by the method selected from the lookup table, a VxML page is uploaded to network management server **88** with a message such as "Unable to access information." This may happen, for example, where the user intended to check the load for a router at IP address 10.10.10.10, but accidentally voiced the IP address 20.20.20.20 pointing to a dead link.

In box **236**, the component access server **82** queries the network component **110** at IP address 10.10.10.10 for the information requested by the user. For example, in box **238**, the SNMP session returns with a value of "Ethernet 0, Ethernet 1." In box **240**, the component access server **82** sends this network information in the form of a VxML page to the network management server **88**.

Note that, in an alternative embodiment, instead of the component access server **82** sending one or more VxML pages to the management server **88**, the component access server **82** may send the VxML page to the TTS device **94** for translation to an audio stream. The TTS device **94** may then send the audio stream directly to the phone **72**, or through the server **88** to the phone **72**.

In box **242**, the network management server **88** sends the VxML page from the component access server **82** to TTS **94** for conversion to an audio stream. In box **244**, the audio stream is output to the phone **72**. In the example, the TTS **94** may output an audio stream voicing, "Which interface would you like information about: Ethernet 0, Ethernet 1?"

In box **246**, the user may respond by DTMF signaling or voice. In the example, the user chooses Ethernet 0. Based on

the user's response, further VxML based options may be verbally output to the user. For example, in box 248, a next VxML script verbally provides a query option between "1. Reset Counts" and "2. Load." In box 250, the user selects "Load." In box 252, the network component 110 is queried again by server 82 to determine a load value. The load value is obtained and uploaded to the management server 88 as a VxML page or in some other means that allows audio communication with the phone 72. In box 254 of the example, the management server 88 receives the value of 150 from the component access server 82. A new VxML page is rendered to the phone 72 that voices, "The load on Ethernet 0 is 150." In box 256, if this is all the information that the user needs, the phone call is terminated. Alternatively, if the user makes further requests, the above processes are repeated.

FIG. 5 is a schematic representation of a network management system 306 in an alternative embodiment of the present invention. A gateway 304 conducts management operations for network management system 306. If authorized, gateway 304 downloads a voice based script, as one or more TCL (Tool Command Language) pages, from a file server 309. In one example, the TCL page may have predefined actions that it can execute using HTTP GETS. A user at telephone 310 via network 312 interacts with the gateway 304 using DTMF keys on the telephone keypad to communicate a network management request 313.

As described above, the network management request 313 may include more than one transaction with the gateway 304, and may convey an IP address of a desired network component. Gateway 304, upon receiving the DTMF request, may issue an HTTP request 314 to the component access server 317. In the exemplary embodiment, the component access server 317 enables the HTTP interface.

Component access server 317 queries a network component 318 using an HTTP GET data query 320. In one example, a regular expression (REGEXP) device 322 processes network information retrieved from the network components 318. The REGEXP device 322 outputs a file identifier, for example, a single number, to the gateway 304. The file identifier may identify an audio file corresponding to the information received from the network component 318. The gateway 304 downloads the audio file 323 from TFTP (Trivial File Transfer Protocol) server 309 and reads out the audio file 323' to the phone 310. Other embodiments may implement other devices or software as known in the art to translate HTML information into an audio file.

FIG. 6 shows an alternative embodiment of a network management system 400 where the audio conversion devices 407 are outsourced. In the embodiment shown, audio conversion devices such as ASR and TTS are outsourced to an external provider. In the exemplary system, the external provider allows a network administrator 402 to call into its IVR platform 404 and speak or type a query 406 on a standard telephone. The IVR (Interactive Voice Response) platform 404 collects the query information, translates it, and passes it to a component access server 408. Component access server 408 queries network components 410 and retrieves network information using the access methods described above. The server 408 also provides the IVR platform 404 and audio conversion devices 407 with voice based scripts. This allows user queries to be generated using speech or DTMF signals and the voice based scripts to be read out to the operator 402 over a standard telephone.

It may be apparent to one skilled in the art that, alternatively, embodiments could be employed using a VoxML markup language, licensed by Motorola, Inc., Chicago, Ill.,

and described at <http://www.voxml.com>, instead of VxML, if router, servers, and other components that support VoxML are accordingly provided.

The system described above can use dedicated processor systems, micro controllers, programmable logic devices, or microprocessors that perform some or all of the operations. Some of the operations described above may be implemented in software and other operations may be implemented in hardware.

For the sake of convenience, the operations are described as various interconnected functional blocks or distinct software modules. This is not necessary, however, and there may be cases where these functional blocks or modules are equivalently aggregated into a single logic device, program or operation with unclear boundaries. In any event, the functional blocks and software modules or features of the flexible interface can be implemented by themselves, or in combination with other operations in either hardware or software.

Having described and illustrated the principles of the invention in a preferred embodiment thereof, it should be apparent that the invention may be modified in arrangement and detail without departing from such principles. All modifications and variations are claimed coming within the spirit and scope of the following claims.

What is claimed is:

1. A system comprising:

a network management device to receive an inbound call remotely initiated by a voice interface device located remotely with respect to the network management device, the inbound call received without prompting by the network management device such that the inbound call is initiated by the voice interface device and not the network management device;

the network management device to use voice scripts to generate speech verbally presenting network management options over the received call;

the network management device to monitor for verbal network management requests received responsive to presenting the verbal network management options; and

the network management device to convert the verbal network management requests received over the inbound call into electronic text and to use the electronic text for conducting network management operations;

wherein the network management device is a computer operable to remotely reconfigure a router, switch, gateway or other network device.

2. A system according to claim 1 further comprising:

the network management device to receive, over the inbound call, an automatic number identification that corresponds to the voice interface device;

the network management device to compare the automatic number identification that indicates a telephone number for the voice interface device to a stored authorization phone number for authorization; and

the network management device to conduct the network management operations when there is authorization based on the comparison.

3. A system according to claim 2 further comprising:

the voice interface device to transfer an inputted personal identification number over the inbound call to the network management device, the inputted personal identification number corresponding to a user of the voice interface device;

the network management device to receive, over the inbound call, the inputted personal identification number that corresponds to the user;

the network management device to determine based on the received personal identification number whether the user of the voice interface device is an authorized user; and

the network management device to use the electronic text for conducting network management operations only when there is authorization based on the comparison and when the user of the voice interface device is authorized.

4. A system according to claim 3 wherein the voice interface device is a Voice over Internet Protocol (VoIP) phone.

5. A system according to claim 3 wherein the verbal network management requests comprise speech.

6. A system according to claim 1 wherein the network management device uses the electronic text to generate verbal prompts for initiating the network management operations and to communicate network component configuration information responsive to the network management operations.

7. A system according to claim 1 including a component access device for querying network components for status information.

8. A system according to claim 7 wherein the component access device is part of the network management device or a stand alone server.

9. A system according to claim 7 wherein the component access device includes a lookup table identifying IP addresses for the network components and associated access protocols used for conducting the network management operations.

10. A system as in claim 1 including a file server containing the electronic text for verbally identifying the network management operations and reporting results of the network management operations.

11. A system according to claim 1 wherein the electronic text is in VxML (Voice Extensible Markup Language).

12. The system according to claim 1 wherein the network is the Publicly Switched Telephone Network (PSTN).

13. The system according to claim 1 wherein the automatic number identification is provided by a Dialed Number Identification Service (DNIS).

14. A method of performing a network management operation, comprising:

- generating voice scripts using management information received across a network over a remotely initiated connection that is initiated using a phone;
- using the voice scripts to identify and initiate network management operations for a network processing device;
- conducting network management operations on the network processing device according to phone responses to the voice scripts, the phone responses being received over the remotely initiated connection; and
- using the voice scripts to report the results of the network management operations back to the phone over the remotely initiated connection.

15. A method according to claim 14 including using the voice scripts to generate speech verbally presenting network management options over the phone, the network management options including pinging a network component to determine if it is up and available, providing information on the interfaces of a router or restarting a router.

16. A method according to claim 15 including using a VxML (Voice Extensible Markup Language) for generating the voice scripts.

17. A method according to claim 14 including receiving speech or DTMF (Dual Tone Multi-Frequency) signals as responses to the voice scripts.

18. A method according to claim 17 including converting the speech or DTMF signals into computer readable text and using the text for conducting the network management operation on the network processing device.

19. A method according to claim 18 including identifying an Internet Protocol (IP) address for the network processing device in the text and using the IP address to identify a network management query protocol supported by the network processing device.

20. A method according to claim 19 including using the query protocol to obtain status information for the network processing device, converting the status information into speech, and sending the speech to the phone.

21. A method according to claim 14 including using the voice based scripts and voice commands from the phone to identify operating status and load conditions for an IP router.

22. The method according to claim 14 wherein the network is the Publicly Switched Telephone Network (PSTN).

23. The method according to claim 14 further comprising generating the voice scripts after verifying that a user of the phone is authorized.

24. The method according to claim 23 further comprising: identifying a phone number belonging to the phone; and determining that the remotely initiated connection is authorized when the identified phone number matches a stored authorized phone number.

25. The method according to claim 24 wherein Automatic Number Identification (ANI) or Dialed Number Identification Service (DNIS) is used to identify the phone number.

26. The method according to claim 14 further comprising: receiving a user identification number over the remotely initiated connection, the user identification number identifying a user of the phone; and determining that the user is authorized based on the user identification number and when the remotely initiated connection is authorized by verifying a phone number of the phone.

27. A system of performing a network management operation, comprising:

- means for generating voice scripts in a first network using management information included in an inbound call that is initiated from a remote second network, the inbound call being unsolicited and initiated from the second network and not the first network;
- means for using the voice scripts to identify and initiate network management operations for a network processing device;
- means for conducting network management operations on the network processing device according to audible responses to the voice scripts, the audible responses being received over the inbound call; and
- means for using the voice scripts to report the results of the network management operations back to the remote second network.

28. A system according to claim 27 including means for using the voice scripts to generate speech verbally presenting the network management options to a remote user that initiated the inbound call.

29. A system according to claim 28 including means for using a VxML (Voice Extensible Markup Language) for generating the voice scripts.

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30. A system according to claim 27 wherein the audible responses are speech or DTMF (Dual Tone Multi-Frequency) signals.

31. A system according to claim 30 including means for converting the speech or DTMF signals into computer readable text and using the text for conducting the network management operations on the network processing device.

32. A system according to claim 31 including means for identifying an Internet Protocol (IP) address for the network processing device in the text and using the IP address to identify a network management query protocol supported by the network processing device.

33. A system according to claim 32 including means for using the query protocol to obtain status information for the network processing device, converting the status information into speech, and sending the speech to the remote second network.

34. A system according to claim 27 including means for using the voice based scripts and voice commands received over the inbound call to identify operating status and load conditions for an IP router.

35. The system of claim 27 wherein the first network is a packet switched network and the second network is a circuit switched network.

36. A computer readable medium including instructions that when executed are operable to:

generate voice scripts using management information received over a remotely initiated inbound call that is initiated using a voice interface device;

use the voice scripts to identify and initiate network management operations for a network processing device;

conduct network management operations on the network processing device according to responses to the voice scripts, the responses being received over the remotely initiated inbound call; and

use the voice scripts to report the results of the network management operations back to the voice interface device.

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37. The computer readable medium according to claim 36, wherein the instructions when executed are further operable to use the voice scripts to generate speech verbally presenting the network management options to a user of the voice interface device.

38. The computer readable medium according to claim 37, wherein the instructions when executed are further operable to use a VxML (Voice Extensible Markup Language) for generating the voice scripts.

39. The computer readable medium according to claim 36, wherein the instructions when executed are further operable to receive speech or DTMF (Dual Tone Multi-Frequency) signals as responses to the voice scripts.

40. The computer readable medium according to claim 39, wherein the instructions when executed are further operable to convert the speech or DTMF signals into computer readable text and use the text for conducting the network management operation on the network processing device.

41. The computer readable medium according to claim 40, wherein the instructions when executed are further operable to identify an Internet Protocol (IP) address for the network processing device in the text and use the IP address to identify a network management query protocol supported by the network processing device.

42. The computer readable medium according to claim 41, wherein the instructions when executed are further operable to use the query protocol to obtain status information for the network processing device, to convert the status information into speech, and to send the speech to the voice interface device.

43. The computer readable medium according to claim 36, wherein the instructions when executed are further operable to use the voice based scripts and voice commands from the voice interface device to identify operating status and load conditions for an IP router.

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